JATRORRHIZINE CHLORIDE AND OTHER CONSTITUENTS FROM FAGARA CHALYBEA ENGL.

Rep. Fac. Sci., Kagoshima Univ., (Math., Phys. & Chem.)
No. 23, p. 153-157, 1990.

JATRORRHIZINE CHLORIDE AND OTHER CONSTITUENTS FROM *FAGARA CHALYBEA* ENGL.

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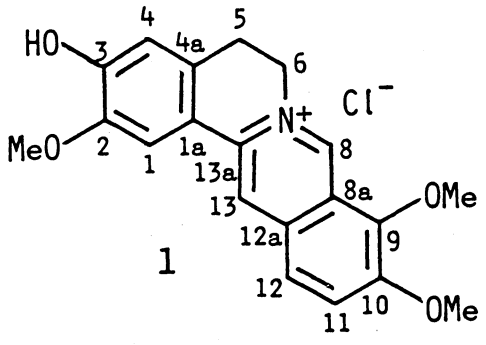
(received Sept. 7, 1990)

Abstract

Isoquinoline alkaloid jatrorrhizine chloride was isolated as an antimicrobial component from the root bark of an African medicinal plant *Fagara chalybea*, along with hesperidine, lupenone, lupeol, (−)-asarinin and 2-tridecanone not observed previously in this species.

Introduction

Fagara chalybea Engl. (Rutaceae) is a well-known Indian and African medicinal plant. The boiled root decoction is drunk for the treatment of a chest pain [**1**]. Only alkaloid fraction from the root and stem bark has been well studied [**2**]. In continuation of our study on African medicinal plants [**3**], we examined costituents of the root bark and isolated nine known compounds, in which jatrorrhizine chloride (**1**) as an antibacterial component, as well as five compounds, hesperidine (**2**), (−)-asarinin (**4**), lupenone (**6**), lupeol (**7**) and 2-tridecanone (**10**), were first observed in this species.



1

jatrorrhizine chloride

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Results and Discussion

Dried root bark of *F. chalybea* was extracted successively with *n*-hexane, acetone and methanol. The hexane and methanol extracts showed antibacterial activity. DCCC (droplet countercurrent chromatography) separation of the methanol extract using chloroform-methanol-water solvent system in ascending mode, afforded an isoquinolin alkaloid, jatrorrhizine chloride (**1**), and a flavanone glycoside, hesperidin (**2**), in which the former showed antibacterial activity against Gram-negative *Pseudo. aeruginosa* and *Pro. vulgaris* at 100 μg/ml [4]. The ^{1}H and ^{13}C NMR assignments of **1** were summarized in Table 1.

From the hexane extract, five known compounds, (+)-sesamin (**3**), (−)-asarinin (**4**), dihydrochelerythrine (**5**), lupenone (**6**) and lupeol (**7**), were identified. As dihydrochelerythrine (**5**) was estremely unstable in solvents like chloroform or methanol [5] and converted into a mixture with yellowish chelerythrine (**8**) during purification,

Table 1. ^{1}H and ^{13}C NMR data of jatrorrhizine chloride 1 in CD_3OD and the acetate in $CDCl_3$

^{1}H	1 δ_H (J)	Acetate δ_H (J)	^{13}C	1 δ_C	Acetate δ_C
1-H	7.65s	7.68s	C-1	111.0	110.4
			C-1a	120.2	125.1
			C-2	152.8	151.7
			C-3	150.0	142.6
4-H	6.86s	6.99s	C-4	116.8	122.8
			C-4a	131.1	127.2
5-H	3.28t (6.4)	3.23t (6.1)	C-5	28.5	26.7
6-H	4.96t (6.4)	5.14t (6.1)	C-6	57.8	56.1
8-H	9.71s	10.21s	C-8	146.6	146.6
			C-8a	124.0	122.3
			C-9	146.9	145.2
			C-10	152.6	150.9
11-H	8.09d (9.3)	8.06d (8.8)	C-11	129.1	126.2
12-H	7.99d (9.3)	7.73d (8.8)	C-12	125.2	123.8
			C-12a	136.3	133.4
13-H	8.74s	8.96s	C-13	121.7	121.6
			C-13a	141.1	136.9
2-OMe	4.10s	4.04s	2-OMe	58.4	57.2
9-OMe	4.20s	4.26s	9-OMe	63.3	62.7
10-OMe	4.02s	4.02s	10-OMe	58.2	57.0
3-OAc		2.17s	3-OAc		20.6
					168.5

it was isolated and identified as an acetonide, acetonyldihydrochelerythrine (**9**) [6] (Fig. 1). On the other hand, the acetone extract afforded 2-tridecanone (**8**) along with an artefact acetonyldihydrochelerythrine (**9**).

Experimental

Mps: uncorr. All the compounds were identified by IR, UV, MS and NMR spectra, and elemental analysis.

Plant material. Collected at Shimba Hill near Monbasa, Kenya and identified by Dr. S. F. Dossaji (University of Nairobi, Kenya).

Extraction and isolation. Air-dried root bark (550 g) was extracted successively with *n*-hexane, acetone and methanol. The methanol extract was chromatographed on DCCC (ascending method) using $CHCl_3$-MeOH-H_2O (7: 13: 8 v/v) to give two almost pure fractions A and B. Yellowish fraction A gave a yellow powder from MeOH, which was recrystallized from MeOH and finally purified by HPLC to give orange needles 1 (22 mg); mp 105−106° (lit. 105°), which gave an acetate with Ac_2O in py. Fraction B afforded a white powder from MeOH, which was crystallized from MeOH-H_2O to give 320 mg of hesperidin (**2**), mp 276° (lit. 262°); octaacetate: mp 179° (lit. 176−178°). Hexane extract (4.8g) was dissolved into CH_2Cl_2 to give a precipitate, which was recrystallized from hexane-CH_2Cl_2 to give (+)-sesamine (**3**) (125 mg), mp 128° (lit. 122−

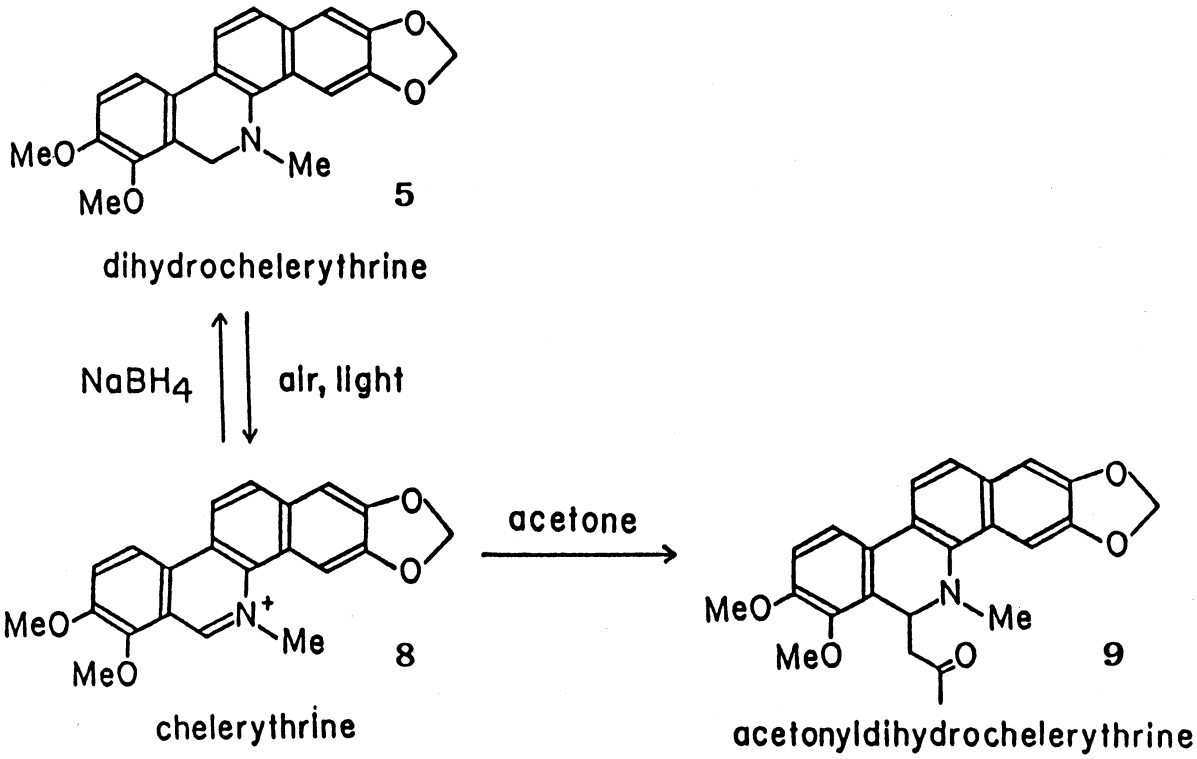
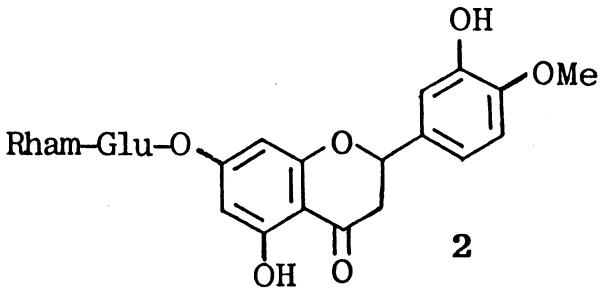


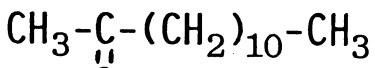
Figure 1

124°), $[\alpha]_D$ +70° (hexane). The CH_2Cl_2 soln was chromatographed on SiO_2 to give (+)-sesamine (**3**) (38 mg), (−)-asarinin (**4**) (14 mg), mp 122° (lit. 123°), $[\alpha]_D$-125° ($CHCl_3$), lupenone (**6**) (45 mg) mp 171° (lit. 170°), $[\alpha]_D$+65° ($CHCl_3$), lupeol (**7**) (110 mg), mp 215° (lit. 215°), $[\alpha]_D$ + 30° ($CHCl_3$), and a mixture (270 mg) of dihyd-



2

hesperidin



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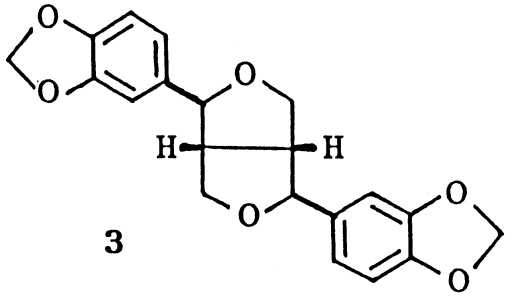
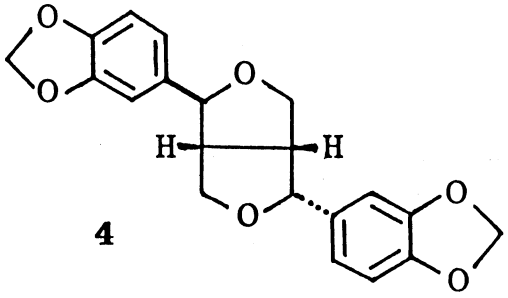
2-tridecanone



3

(+)-sesamin



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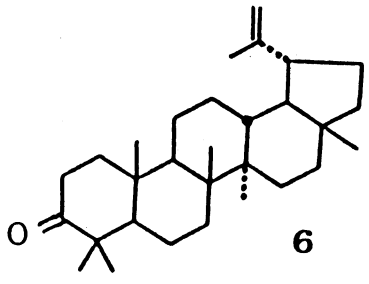
(−)-asarinin



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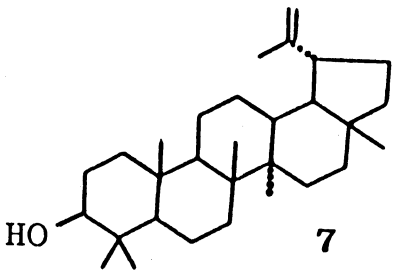
lupenone



7

lupeol

rochelerythrine (**5**) and chelerythrine (**8**), which was dissolved into acetone for one week to give acetonyldihydrochelerythrine (**9**) (132 mg), mp 203° (lit. 203°), $[\alpha]_D$ 0° ($CHCl_3$). Acetone extract (2.9g) was chromatographed on SiO_2 to give acetonyldihydrochelerythrine (**9**) (390 mg) and 2-tridecanone (**10**), oil (310 mg); 2, 4-DNP: mp 74°.

Antimicrobial test. Test organism: fungus; *Rh. chinensis* IFO 4745 and *Asp. niger* ATCC 6275: yiest; *S. cerevisiae* IFO 0203 and *C. albicans* IFO 1061: bacteria; *S. sureus* NCTC 8530, *B. subtilis* IFO 3007, *E. coli* IFO 3545, *Pseudo. aeruginosa* IFO 3080 and IFO 3445, *Pseudo. fluorescens* IFO 3081, *Pro. vulgaris* IFO 3851 and *Ser. marcescens* IFO 3046.

Acknowledgements—We are grateful to Professor I. Kubo (University of California) for his help in the collection of *F. chalybea* and to Dr. S. F. Dossaji (University of Nairobi) for the identification of the plant. Our thanks are also due to Professor M. Taniguchi (Osaka City University) for the antimicrobial test.

REFERENCES

1. Kokwaro, J. O. (1976) in *Medicinal Plants of East Africa*, East African Literature Bureau, Nairobi.
2. Fish. F. and Waterman, P. G. (1972), *Phytochemistry*, **11**, 3007.
3. Nakatani, M., Iwashita, T., Mizukawa, K. and Hase, T. (1987), *Heterocycles*, **26**, 43.
4. Jatrorrhizine shows antibacterial activity against *Myco. smegmatis*: Wu, W. N., Bael, J. L., Mitscher, L.A., Salman, K. N. and Patil, P. (1976), *Lloydia*, **39**, 204.
5. Chou, F. Y., Hostettmann, K., Kubo, I. and Nakanishi, K. (1977), *Heterocycles*, **7**, 969.
6. Desai, P. D., Govindachari, T. R., Nagarajan, K. and Viswanathan, N. (1967). *Indian J. Chem.*, **5**, 42.